

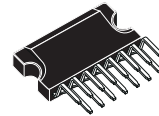


## 5W+5W AMPLIFIER WITH DC VOLUME CONTROL

PRODUCT PREVIEW

- 5+5W OUTPUT POWER  
 $R_L = 8\Omega$  @THD = 10%  $V_{CC} = 22V$
- ST-BY AND MUTE FUNCTIONS
- LOW TURN-ON TURN-OFF POP NOISE
- LINEAR VOLUME CONTROL DC COUPLED WITH POWER OP. AMP.
- NO BOUCHEROT CELL
- NO ST\_BY RC INPUT NETWORK
- SINGLE SUPPLY RANGING UP TO 35V
- SHORT CIRCUIT PROTECTION
- THERMAL OVERLOAD PROTECTION
- INTERNALLY FIXED GAIN
- SOFT CLIPPING
- VARIABLE OUTPUT AFTER VOLUME CONTROL CIRCUIT
- CLIPWATT 15 PACKAGE

### MULTIPOWER BI50II TECHNOLOGY



Clipwatt 15  
ORDERING NUMBER: TDA7496SA

amplifier assembled in the @Clipwatt 15 package, specially designed for high quality sound TV applications.

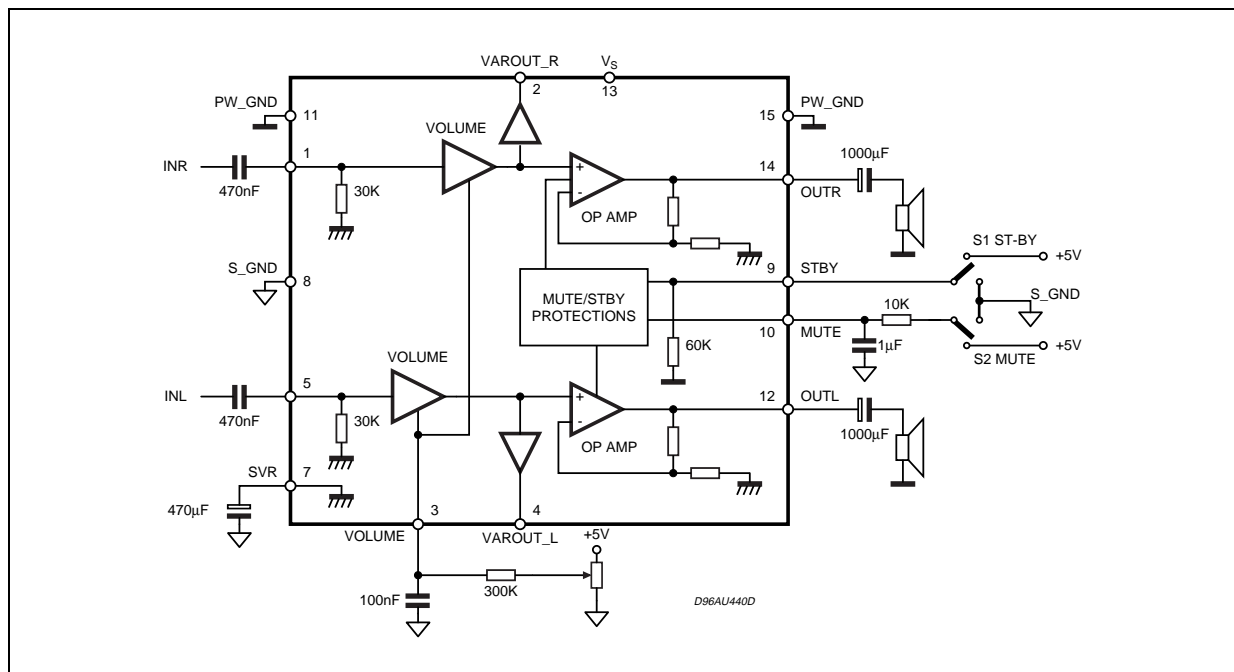
Features of the TDA7496SA include linear volume control Stand-by and Mute functions.

The TDA7496SA is pin to pin compatible with TDA7496, TDA7496S, TDA7496SA, TDA7495, TDA7495SA, TDA7494S, TDA7494SA.

### DESCRIPTION

The TDA7496SA is a stereo 5+5W class AB power

### BLOCK DIAGRAM

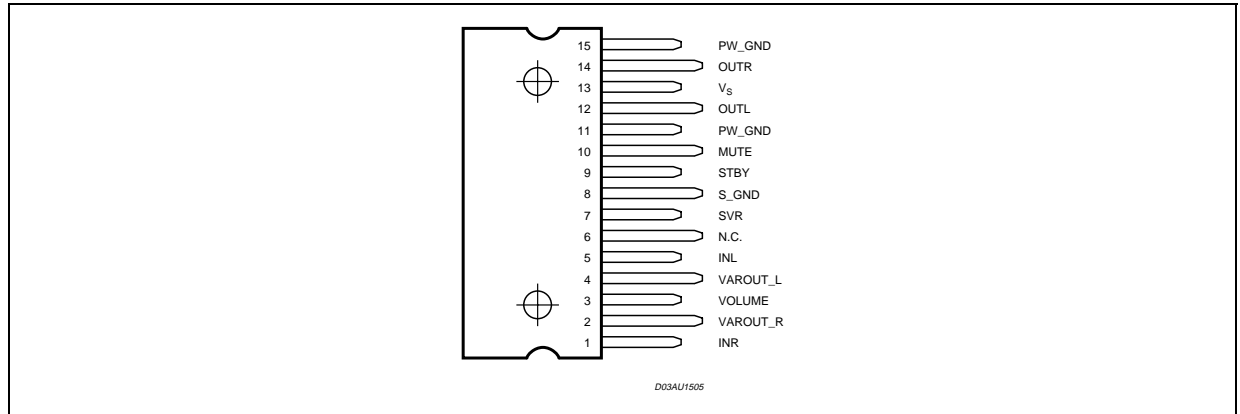


# TDA7496SA

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>S</sub>	DC Supply Voltage	35	V
V <sub>IN</sub>	Maximum Input Voltage	8	V <sub>pp</sub>
P <sub>tot</sub>	Total Power Dissipation (T <sub>amb</sub> = 70°C)	16	W
T <sub>amb</sub>	Ambient Operating Temperature (1)	0 to 70	°C
T <sub>stg</sub> , T <sub>J</sub>	Storage and Junction Temperature	-40 to 150	°C
V <sub>3</sub>	Volume Control DC Voltage	7	V

## PIN CONNECTION (top view)



## THERMAL DATA

Symbol	Parameter	Value	Unit
R <sub>th j-case</sub>	Thermal Resistance junction-case	Typ. = 4.5; Max. = 5	°C/W
R <sub>th j-amb</sub>	Thermal Resistance junction-ambient Max.	48	°C/W

## ELECTRICAL CHARACTERISTICS

(Refer to the test circuit R<sub>L</sub> = 8Ω, f = 1KHz, R<sub>G</sub> = 50Ω, V<sub>S</sub> = 22V, T<sub>amb</sub> = 25°C)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V <sub>S</sub>	Supply Voltage Range		10		32	V
I <sub>q</sub>	Total Quiescent Current			25	50	mA
DCV <sub>os</sub>	Output DC Offset Referred to SVR Potential	No Input Signal		200		mV
V <sub>O</sub>	Quiescent Output Voltage			11		V
P <sub>O</sub>	Output Power	THD = 10%; R <sub>L</sub> = 8Ω; THD = 1%; R <sub>L</sub> = 8Ω;	5	5.5 4		W
		THD = 10%; R <sub>L</sub> = 4Ω; V <sub>S</sub> = 12V THD = 1%; R <sub>L</sub> = 4Ω; V <sub>S</sub> = 12V		2.1 1.0		W
THD	Total Harmonic Distortion	G <sub>V</sub> = 30dB; P <sub>O</sub> = 1W; f = 1KHz			0.4	%

**ELECTRICAL CHARACTERISTICS** (continued)(Refer to the test circuit  $R_L = 8\Omega$ ,  $f = 1\text{KHz}$ ,  $R_G = 50\Omega$ ,  $V_S = 22\text{V}$ ,  $T_{\text{amb}} = 25^\circ\text{C}$ )

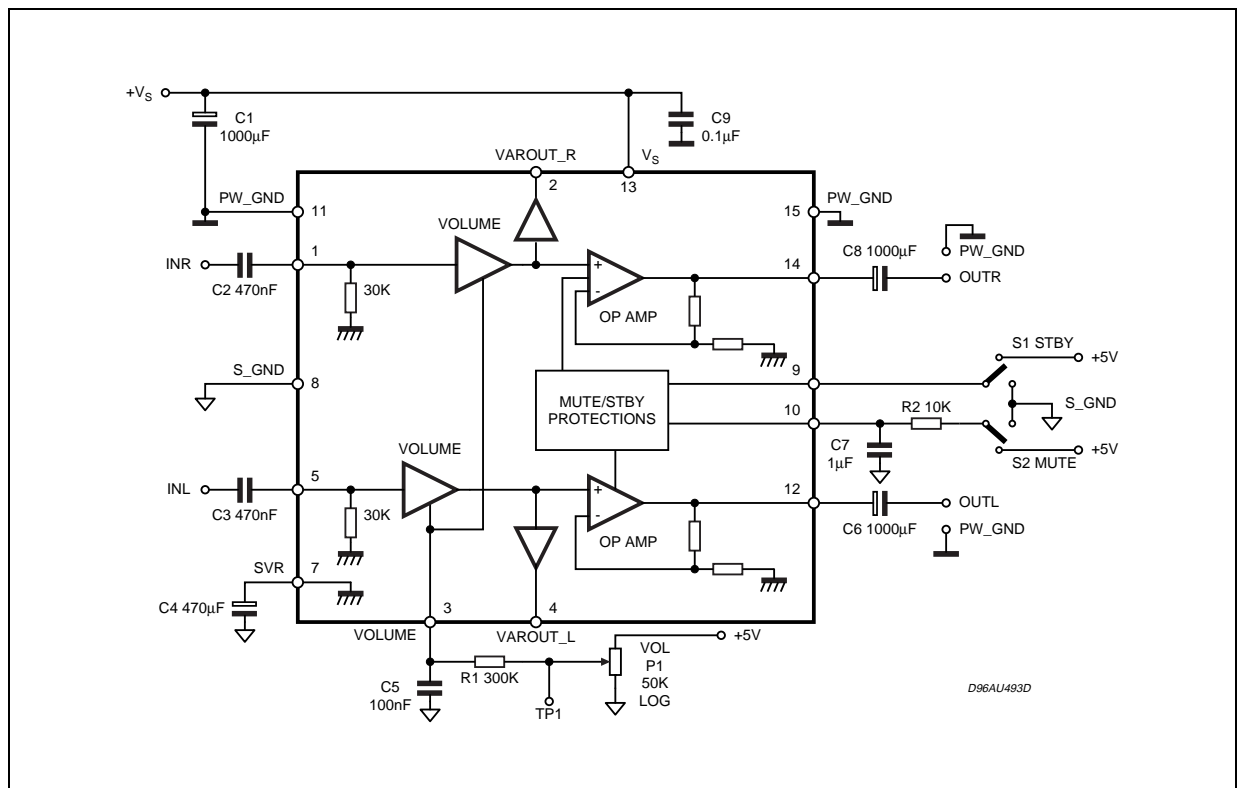
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$I_{\text{peak}}$	Output Peak Current	(internally limited)	1.0	1.3		A
$V_{\text{IN}}$	Input Signal				2.8	V <sub>rms</sub>
$G_V$	Closed Loop Gain	$V_{\text{OI Ctrl}} > 4.5\text{V}$	28.5	30	31.5	dB
$G_{\text{VLine}}$	Monitor Out Gain	$V_{\text{OI Ctrl}} > 4.5\text{V}$ ; $Z_{\text{load}} > 30\text{K}\Omega$	-1.5	0	1.5	dB
$A_{\text{Min VOL}}$	Attenuation at Minimum Volume	$V_{\text{OI Ctrl}} < 0.5\text{V}$	80			dB
BW				0.6		MHz
$e_N$	Total Output Noise	$f = 20\text{Hz to } 22\text{KHz}$ PLAY, max volume		500	800	$\mu\text{V}$
		$f = 20\text{Hz to } 22\text{KHz}$ PLAY, max attenuation		100	250	$\mu\text{V}$
		$f = 20\text{Hz to } 22\text{KHz}$ MUTE		60	150	$\mu\text{V}$
SR	Slew Rate		5	8		V/ $\mu\text{s}$
$R_i$	Input Resistance		22.5	30		$\text{K}\Omega$
$R_{\text{Var Out}}$	Variable Output Resistance			30	100	$\Omega$
$R_{\text{L Var Out}}$	Variable Output Load		2			$\text{K}\Omega$
SVR	Supply Voltage Rejection	$f = 1\text{KHz}$ ; max volume $C_{\text{SVR}} = 470\mu\text{F}$ ; $V_{\text{RIP}} = 1\text{Vrms}$	35	39		dB
		$f = 1\text{KHz}$ ; max attenuation $C_{\text{SVR}} = 470\mu\text{F}$ ; $V_{\text{RIP}} = 1\text{Vrms}$	55	65		dB
$T_M$	Thermal Muting			150		$^\circ\text{C}$
$T_S$	Thermal Shut-down			160		$^\circ\text{C}$
<b>MUTE &amp; INPUT SELECTION FUNCTIONS</b>						
$V_{\text{ST-ON}}$	Stand-by ON Threshold		3.5			V
$V_{\text{ST-OFF}}$	Stand-by OFF Threshold				1.5	V
$V_{\text{MUTEON}}$	Mute ON threshold		3.5			V
$V_{\text{MUTEOFF}}$	Mute OFF threshold				1.5	V
$A_{\text{MUTE}}$	Mute Attenuation		50	65		dB
$I_{\text{qST-BY}}$	Quiescent Current @ Stand-by			0.6	1	mA
$I_{\text{stbyBIAS}}$	Stand-by bias current	Stand by ON: $V_{\text{ST-BY}} = 5\text{V}$ ; $V_{\text{mute}} = 5\text{V}$		80		$\mu\text{A}$
		Play or Mute	-20	-5		$\mu\text{A}$
$I_{\text{muteBIAS}}$	Mute Bias Current	Mute		1	5	$\mu\text{A}$
		Play		0.2	2	$\mu\text{A}$

**APPLICATION SUGGESTIONS**

The recommended values of the external components are those shown on the application circuit of figure 1. Different values can be used, the following table can help the designer.

COMPONENT	SUGGESTION VALUE	PURPOSE	LARGER THAN SUGGESTION	SMALLER THAN SUGGESTION
R1	300K	Volume Control Circuit	Larger volume regulation time	Smaller volume regulation time
R2	10K	Mute time constant	Larger mute on/off time	Smaller mute on/off time
P1	50K	Volume Control Circuit		
C1	1000µF	Supply voltage bypass		Danger of oscillation
C2	470nF	Input DC decoupling	Lower low frequency cutoff	Higher low frequency cutoff
C3	470nF	Input DC decoupling	Lower low frequency cutoff	Higher low frequency cutoff
C4	470µF	Ripple rejection	Better SVR	Worse SVR
C5	100nF	Volume control time constant	Larger volume regulation time	Smaller volume regulation time
C6	1000µF	Output DC decoupling	Lower low frequency cutoff	Higher low frequency cutoff
C7	1µF	Mute time constant	Larger mute on/off time	Smaller mute on/off time
C8	1000µF	Output DC decoupling	Lower low frequency cutoff	Higher low frequency cutoff
C9	100nF	Supply voltage bypass		Danger of oscillation

**Figure 1. Application Circuit**

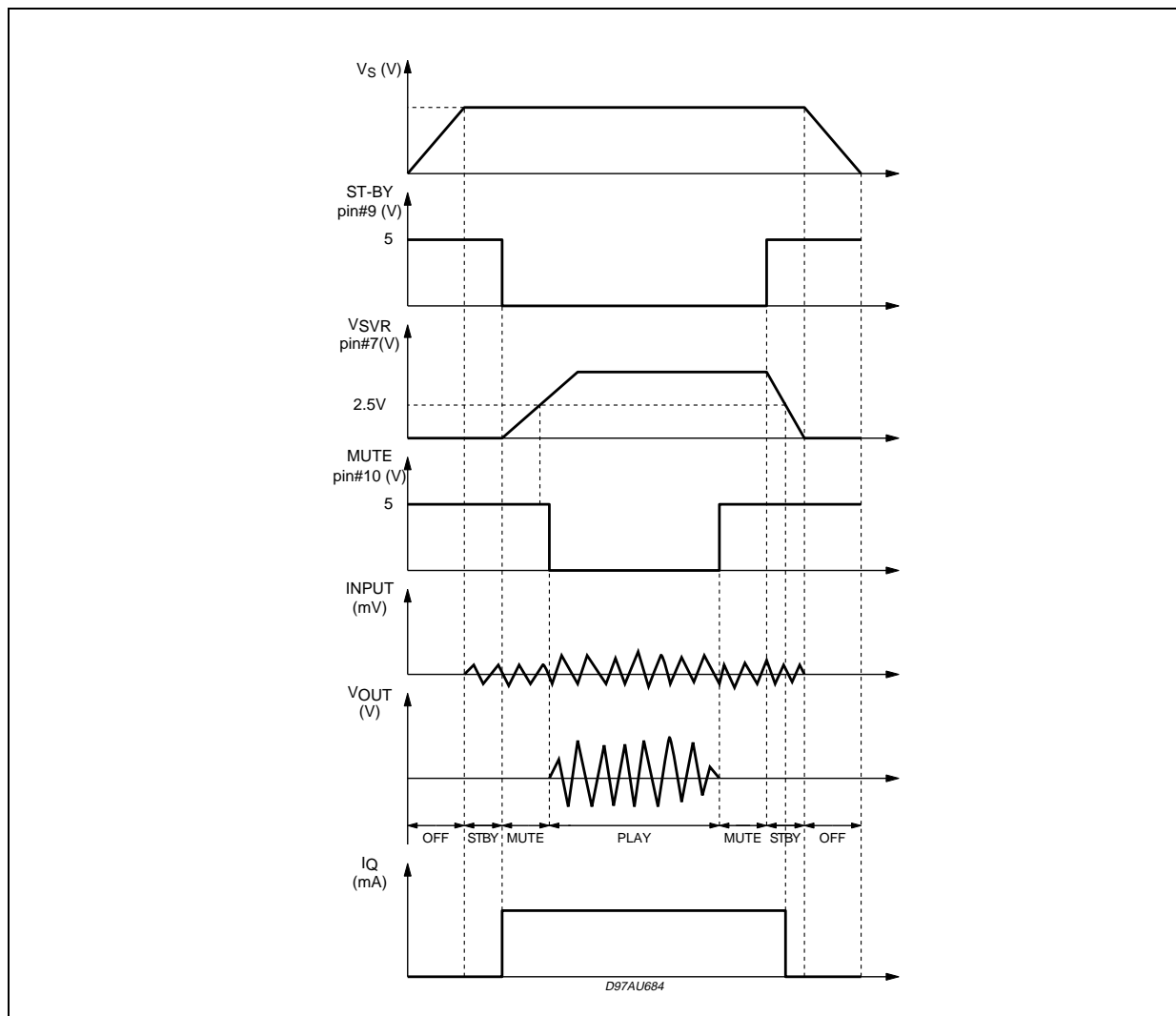


**MUTE STAND-BY TRUTH TABLE**

MUTE	St-BY	OPERATING CONDITION
H	H	STAND-BY
L	H	STAND-BY
H	L	MUTE
L	L	PLAY

Turn ON/OFF Sequences (for optimizing the POP performances)

**Figure 1. USING ONLY THE MUTE FUNCTION**

**USING ONLY THE MUTE FUNCTION**

To simplify the application, the stand-by pin can be connected directly to Ground. During the ON/OFF transitions it is recommended to respect the following conditions:

- At the turn-on the transition mute to play must be made when the SVR pin is higher than 2.5V
- At the turn-off the TDA7496A must be brought to mute from the play condition when the SVR pin is higher than 2.5V.

Figure 2. P.C.B. and Component layout PCB and Component Layout

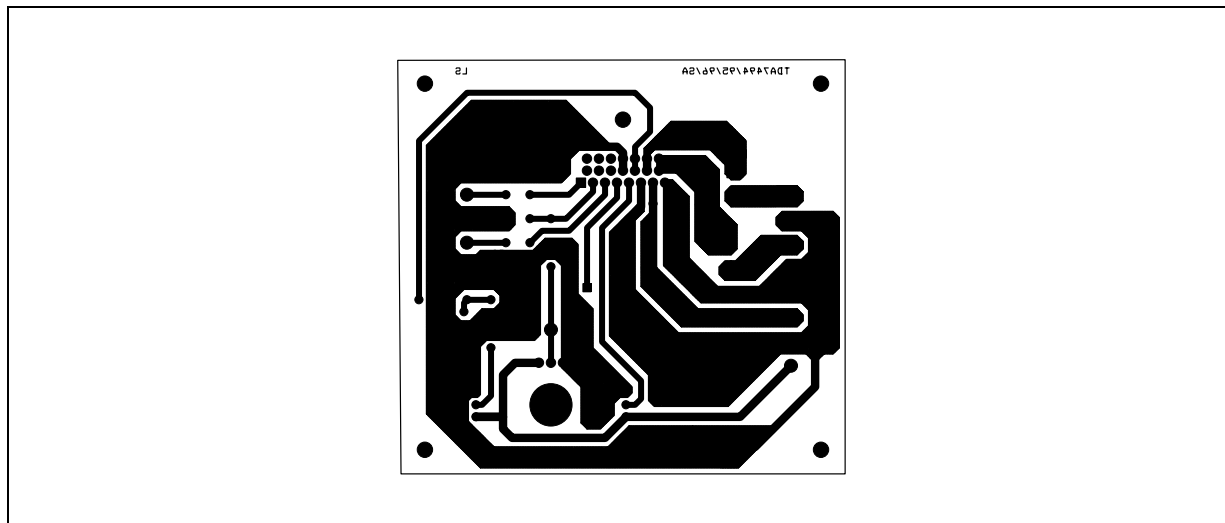


Figure 3.

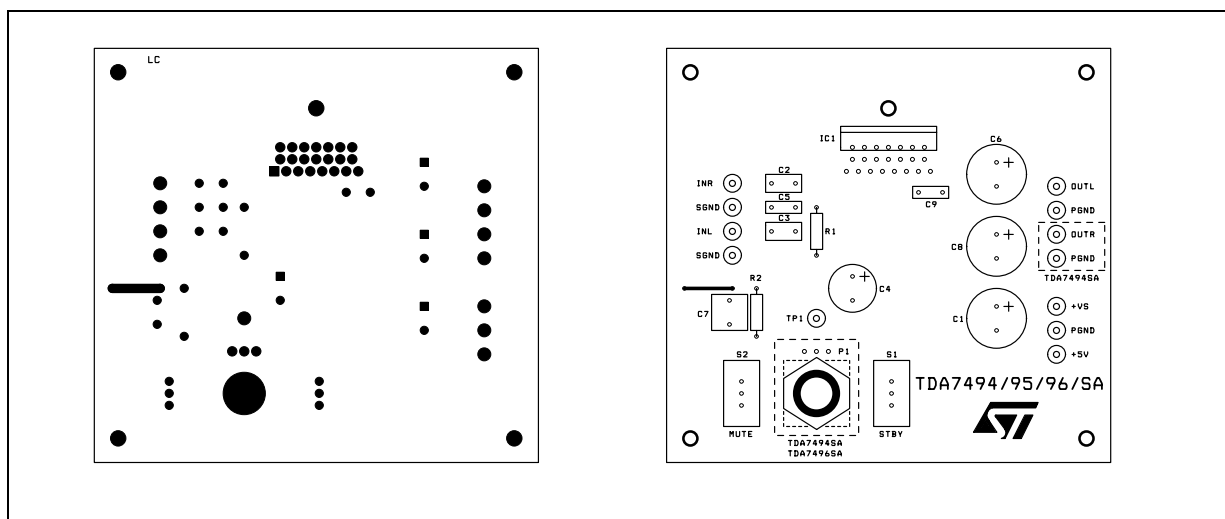


Figure 4. Quiescent Current vs. Supply Voltage

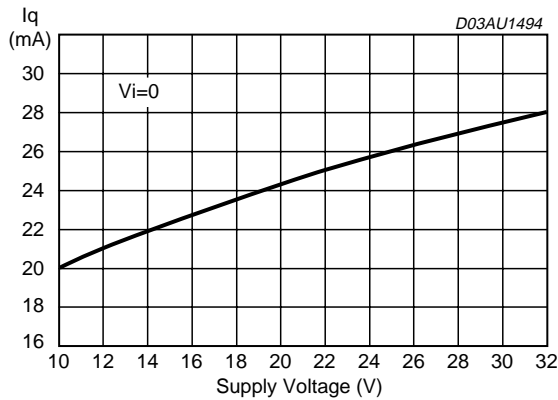


Figure 7. Output DC Offset vs. Supply Voltage

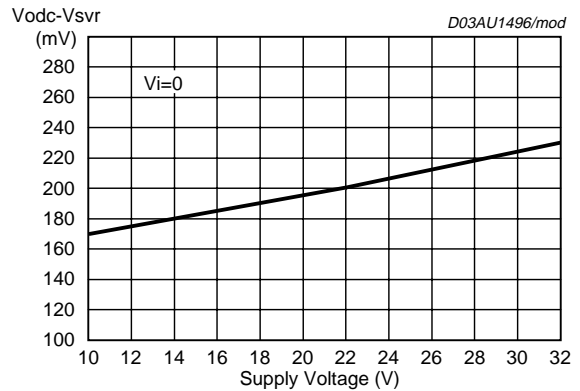


Figure 5. Output Dc Offset vs. Supply Voltage

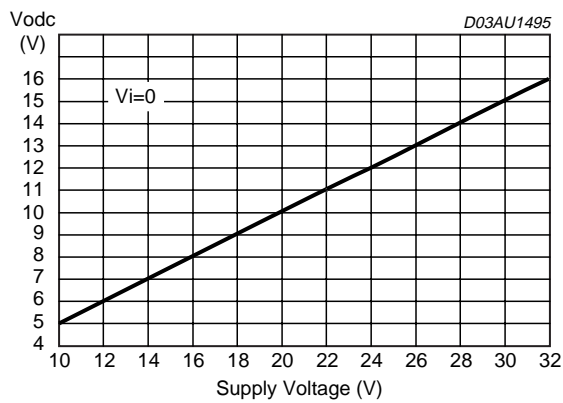


Figure 8. Output Power vs Supply Voltage

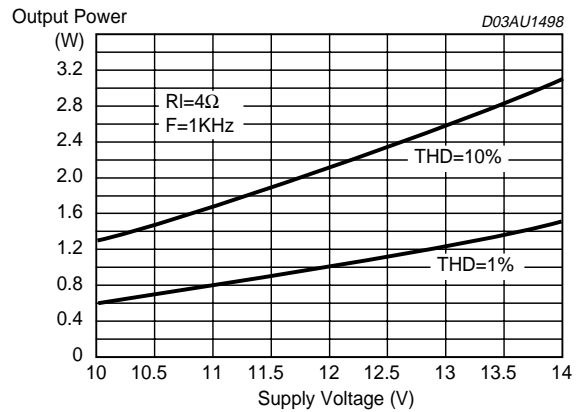


Figure 6. Output Power vs. Supply Voltage

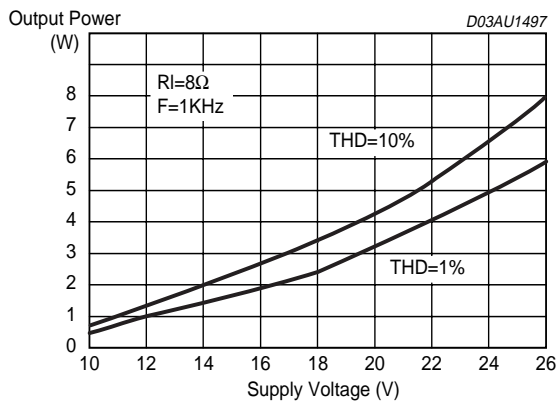


Figure 9. Distortion vs Output Power

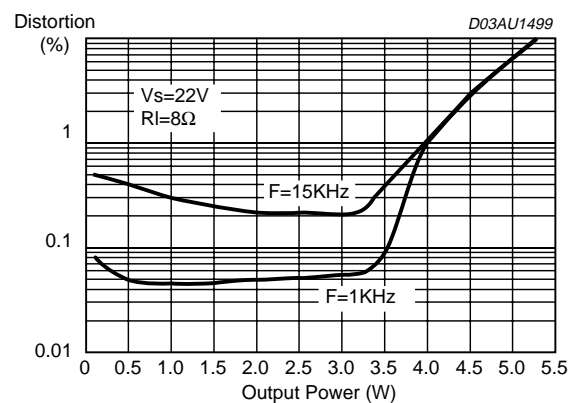


Figure 10. Distortion vs Output Power

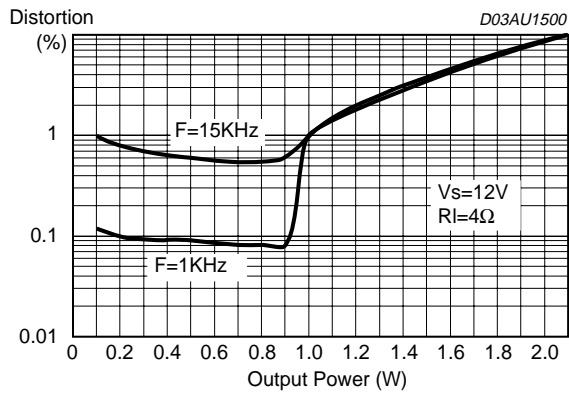


Figure 11. Closed Loop Gain vs. Frequency

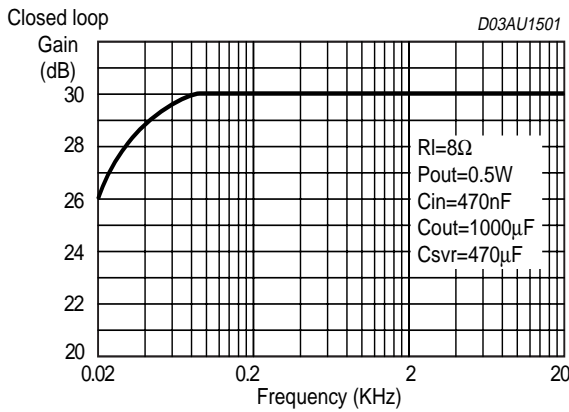


Figure 12. St-By Attenuation vs Vpin 9

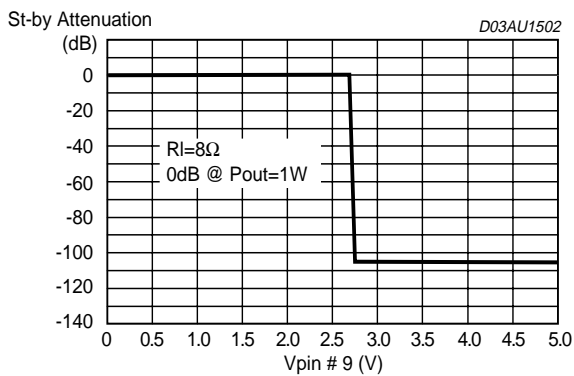
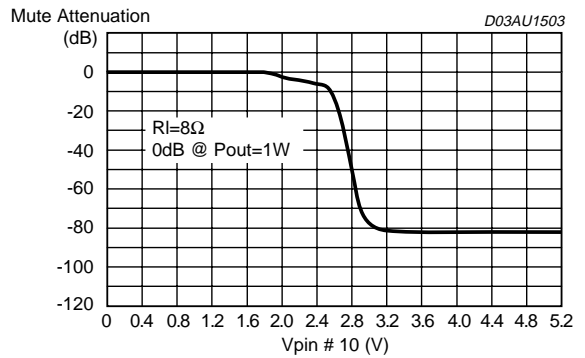


Figure 13. Mute Attenuation vs Vpin 10



PINS DESCRIPTION

Figure 14. PIN SVR

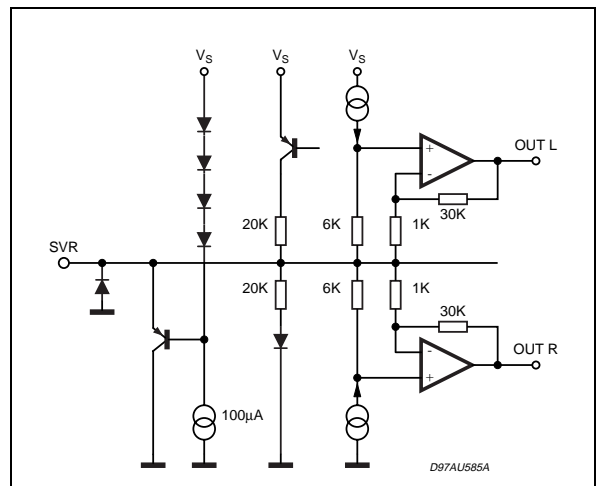


Figure 15. PINS: INL,INR

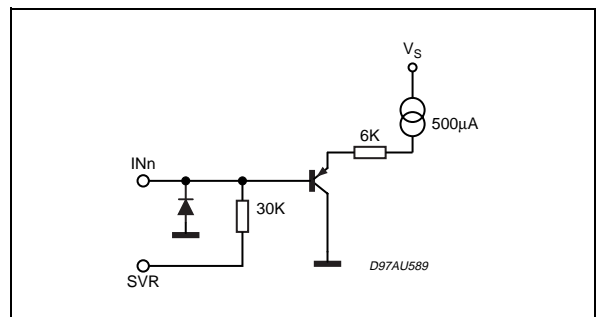




Figure 17. PIN ST-BY

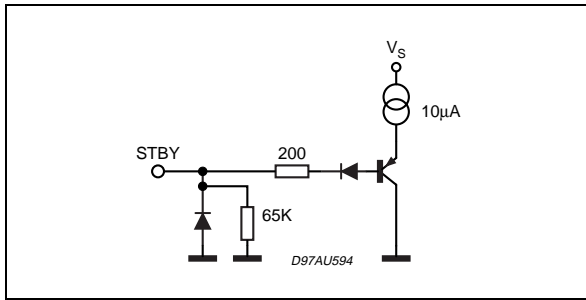


Figure 20. PINS: VAROUT-L VAROUT-R

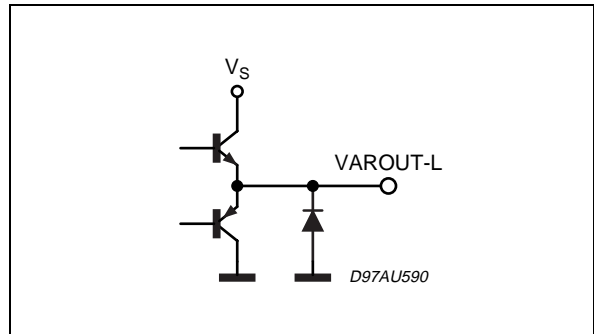


Figure 18. PIN: MUTE

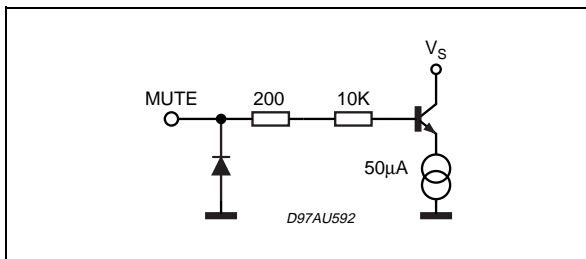


Figure 21. PIN: VOLUME

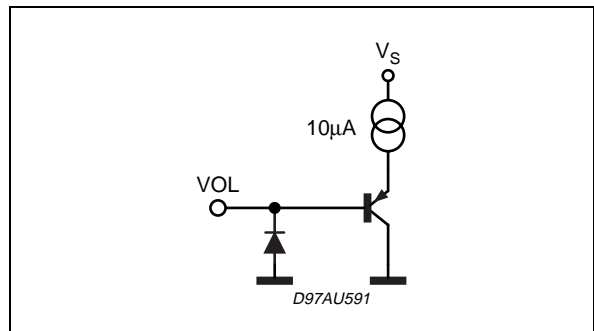


Figure 19. PINS: OUT R, OUT L

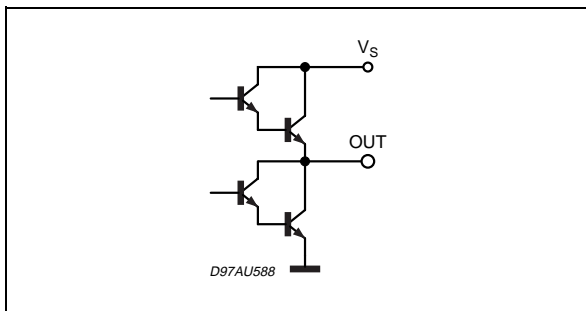
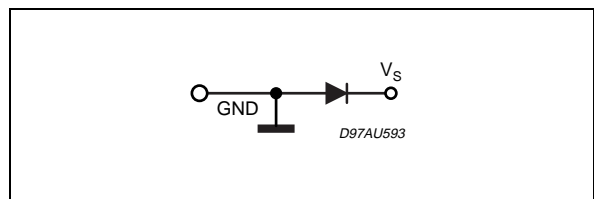


Figure 22. PINS: PW-GND, S-GND



**HEAT SINK DIMENSIONING:**

In order to avoid the thermal protection intervention, that is placed approximatively at  $T_j = 150^\circ\text{C}$ , it is important the dimensioning of the Heat Sink  $R_{Th}$  ( $^\circ\text{C}/\text{W}$ ).

The parameters that influence the dimensioning are:

- Maximum dissipated power for the device ( $P_{dmax}$ )
- Max thermal resistance Junction to case ( $R_{Th\ j-c}$ )
- Max. ambient temperature  $T_{amb\ max}$
- Quiescent current  $I_q$  (mA)

Example:

$V_{CC} = 22\text{V}$ ,  $R_{load} = 80\text{ohm}$ ,  $R_{Th\ j-c} = 5\ ^\circ\text{C}/\text{W}$ ,  $T_{amb\ max} = 50^\circ\text{C}$

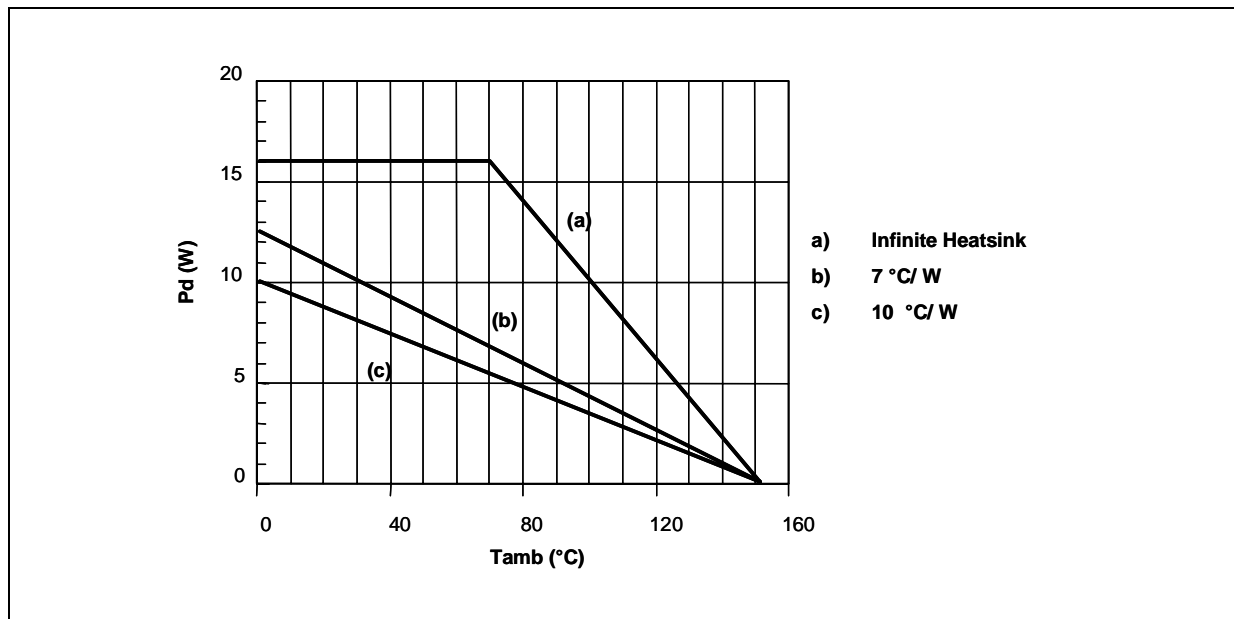
$$P_{dmax} = (N^\circ \text{ channels}) \cdot \frac{V_{cc}^2}{2\Pi^2 \cdot R_{load}} + I_q \cdot V_{cc}$$

$$P_{dmax} = 2 \cdot (3.0) + 0.5 = 6.5\ \text{W}$$

$$(\text{Heat Sink}) R_{Th\ c-a} = \frac{150 - T_{amb\ max}}{P_{d\ max}} - R_{Th\ j-c} = \frac{150 - 50}{6.5} - 5.0 = 10^\circ\text{C}/\text{W}$$

In figure 23 is shown the Power derating curve for the device.

**Figure 23. Power derating curve**



### Clipwatt Assembling Suggestions

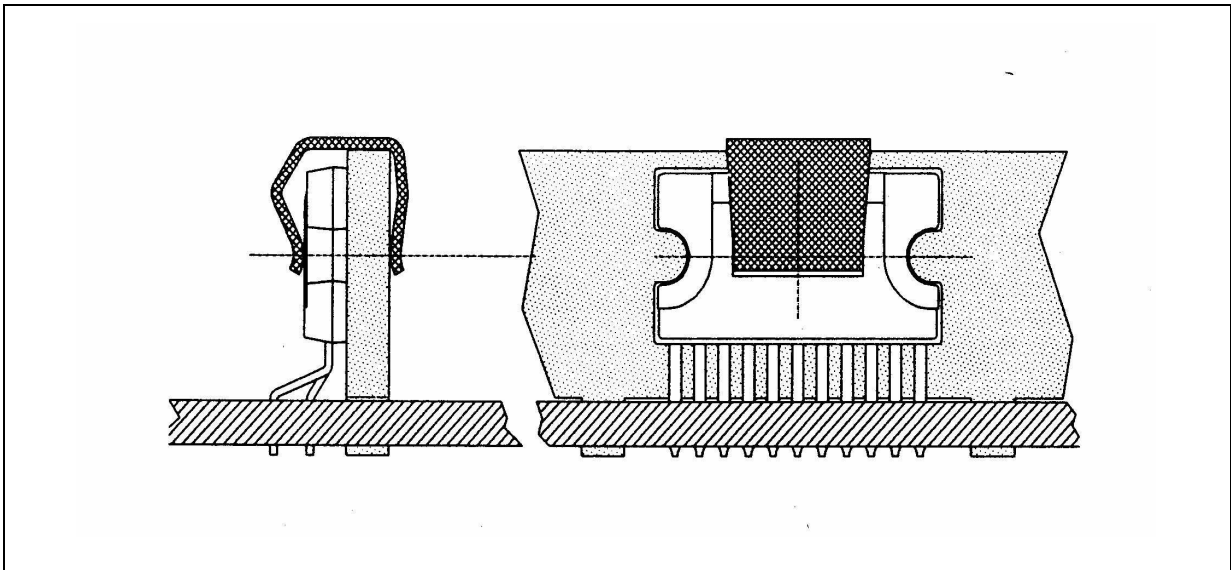
The suggested mounting method of Clipwatt on external heat sink, requires the use of a clip placed as much as possible in the plastic body center, as indicated in the example of figure 24.

A thermal grease can be used in order to reduce the additional thermal resistance of the contact between package and heatsink.

A pressing force of 7 - 10 Kg gives a good contact and the clip must be designed in order to avoid a maximum contact pressure of 15 Kg/mm<sup>2</sup> between it and the plastic body case.

As example, if a 15Kg force is applied by the clip on the package, the clip must have a contact area of 1mm<sup>2</sup> at least.

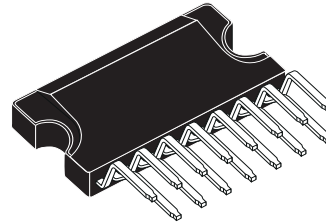
**Figure 24. Example of right placement of the clip**



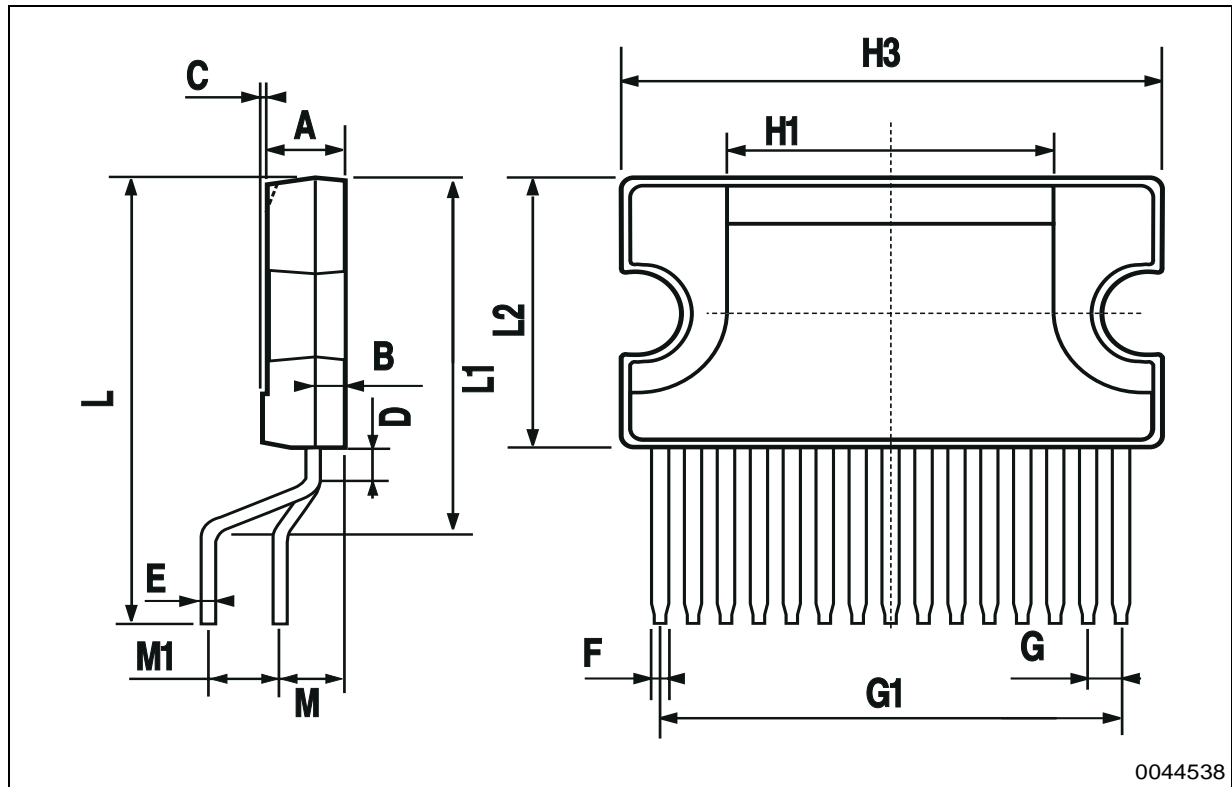
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			3.2			0.126
B			1.05			0.041
C		0.15			0.006	
D		1.55			0.061	
E	0.49		0.55	0.019		0.022
F	0.67		0.73	0.026		0.029
G	1.14	1.27	1.4	0.045	0.050	0.055
G1	17.57	17.78	17.91	0.692	0.700	0.705
H1		12			0.480	
H2		18.6			0.732	
H3	19.85			0.781		
L		17.95			0.707	
L1		14.45			0.569	
L2	10.7	11	11.2	0.421	0.433	0.441
L3		5.5			0.217	
M		2.54			0.100	
M1		2.54			0.100	

**OUTLINE AND MECHANICAL DATA**

Weight: 1.92gr



**Clipwatt15**



0044538

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